

## METHOD OF SELECTIVE REGION VAPOR PHASE ALUMINIZING

### ABSTRACT

The present invention is process for forming diffusion aluminide coatings on an uncoated surface of a substrate, without interdiffusing a sufficient amount of aluminum into a coating layer to adversely affect the coating growth potential and mechanical properties of said coating layer. A metal substrate is provided comprising an external surface and an internal passage therein defined by an internal surface, at least a portion of the external surface of the substrate being coated with a coating layer selected from the group consisting of  $\beta$ -NiAl-base, MCrAlX, a line-of-sight diffusion aluminide, a non-line-of-sight diffusion aluminide, a pack diffusion aluminide, and a slurry diffusion aluminide on said substrate. The external surface of the substrate is cleaned. The metal substrate is subjected to a aluminum vapor phase deposition process performed using a fluorine-containing activator selected from the group consisting of  $\text{AlF}_3$ ,  $\text{CrF}_3$ ,  $\text{NH}_4\text{F}$ , and combinations thereof, at a rate in the range of about 0.036 mols of fluorine per  $\text{ft}^3/\text{hr}$  of transport gas to about 0.18 mols of fluorine per  $\text{ft}^3/\text{hr}$  of transport gas, at a temperature in the range of about  $1350^\circ\text{F}$  ( $730^\circ\text{C}$ ) to about  $1925^\circ\text{F}$  ( $1050^\circ\text{C}$ ), using a transport gas selected from the group consisting of argon, nitrogen, hydrogen, and combinations thereof, the transport gas being provided at a flow rate in the range of about  $20 \text{ ft}^3/\text{hr}$  to about  $120 \text{ ft}^3/\text{hr}$  for a period of time in the range of about 2 hours to about 10 hours. The substrate is then cooled. The present invention is also a superalloy article coated with a diffusion aluminide layer using the diffusion aluminide coating process of the present invention.